



LAKE CLASSIFICATION SHORT REPORT ON GOOSE LAKE, ADAMS COUNTY, WI

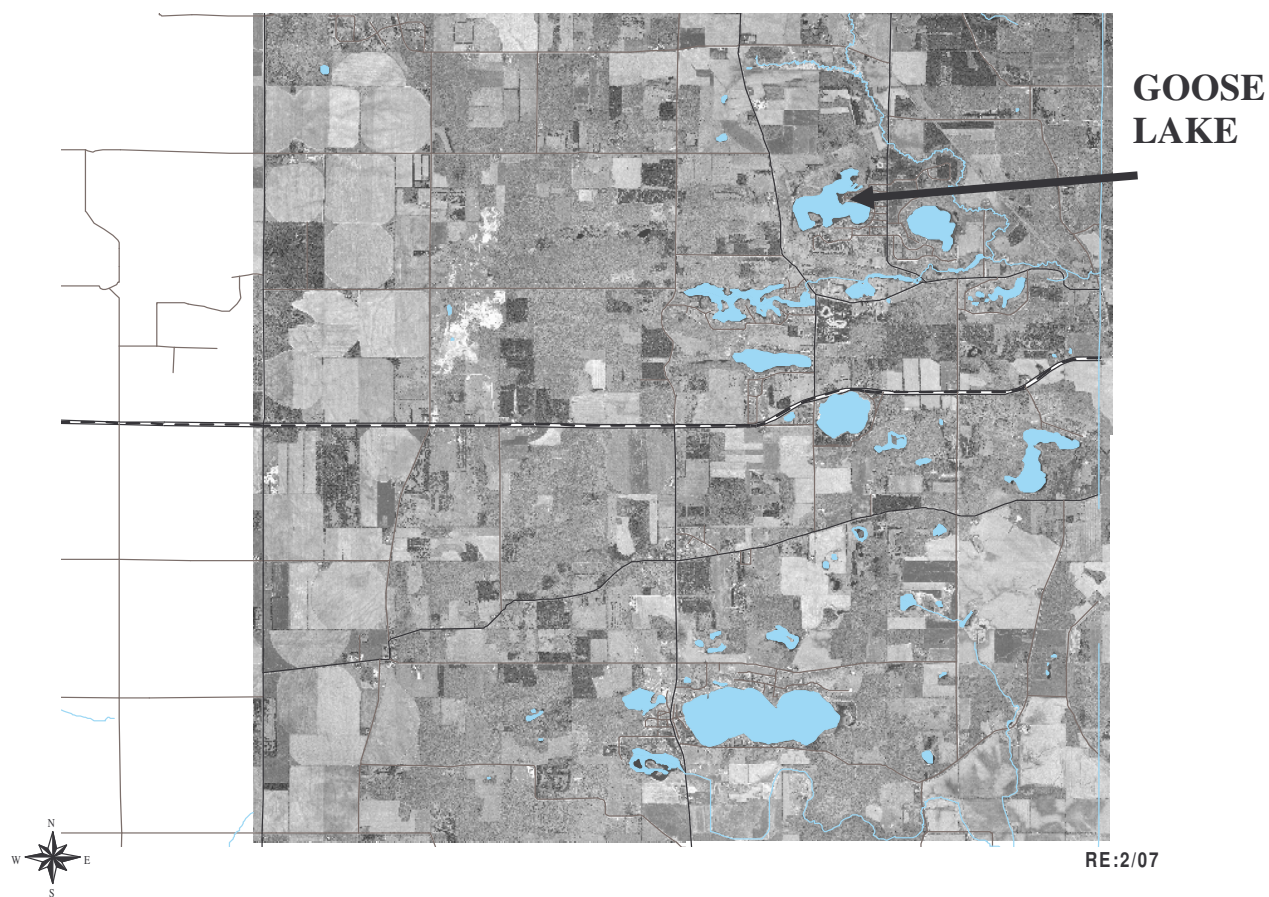
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Introduction

Information about Goose Lake: Goose Lake is located in the Town of Jackson, Adams County, WI (T15N, R7E, S11), in the south central part of Wisconsin. Goose Lake is a mesotrophic/oligotrophic seepage lake with good to very good water quality and clarity. It has 81 surface acres, with a maximum depth of 18 feet and an average depth of 7 feet. As in the case in all seepage lakes, the water level on Goose Lake fluctuates naturally with the underground water table. With no stream outlet, water leaves the lake through groundwater seepage or by evaporation from the lake's surface. The water table in most areas around the lake is fairly near the surface. The southwest basin of the lake provides the deepest water habitat. The north and west basins are deep marshes. An island partially separates the west basin and a peninsula partly separates the north basin. Most of the on-lake residences are along the eastern and southern shores.



Land Use

The surface watershed of Goose Lake is fairly small; the ground watershed is somewhat bigger, with groundwater flowing into the lake from the northwest. Studies have shown that lakes are product of their watershed and that land use has a significant impact on the water quality of a lake, especially in the amount and content of stormwater runoff from the surface. Stormwater runoff volume is affected by the amount of impervious surface, the soil type and the slope of the area. Natural landscapes tend to have low runoff rates.

Land use acreage and percent of total are shown on the table below:

	Surface		Ground		Total	
Goose Lake	Acres	% of Total	Acres	% of Total	Acres	% of Total
Agriculture--Non Irrigated	79.46	17.70%	368.45	36.69%	447.91	30.82%
Agriculture--Irrigated	0	0.00%	94.7	9.43%	94.7	6.52%
Government	0	0.00%	6.3	0.62%	6.3	0.43%
Residential	106.4	23.70%	115.79	59.97%	222.19	15.29%
Water	84.4	18.80%	15.3	1.53%	99.7	6.86%
Woodland	178.68	39.80%	403.69	40.20%	582.37	40.08%
total	448.94	100.00%	1004.23	148.44%	1453.17	100.00%

Forested land is the largest land use category in both the surface and ground watersheds for Goose Lake. Since forest floors are often full of leaves, needles and other duff, stormwater runoff from forested lands is generally less in volume and more filtered than that from agricultural or residential lands.

Residential land use is the second largest land use in the Goose Lake surface watershed. Much of the residential area is concentrated around the lake. This land use category, in some instances, may contribute a significant amount of nutrients to the water from stormwater runoff, mowed lawns, and impervious surfaces.

Slightly over 17.7% of the surface watershed for Goose Lake is agriculture. Agriculture may contribute significant amount of nutrients to a water body.

Goose Lake has wetlands around several of its shores, especially along the north shore. Wetlands play an important role in water quality by trapping many pollutants in runoff waters and by serving as buffers to catch and control what would otherwise be uncontrolled water and pollutants. Wetlands also play an essential role in the aquatic food chain, thus affecting fishery, and also serve as spaces for wildlife habitat, wildlife reproduction & nesting, and wildlife food. It is important to preserve these wetlands for the continued health of Goose Lake waters.

**One of Goose
Lake's shoreland
wetlands**



Goose Lake is a phosphorus-limited lake. This means that of the pollutants that end up in the lake, the one in the shortest supply and most affects the overall quality of the lake water is phosphorus. Land use types play a major role in determining the amount of phosphorus being loaded into the lake. Based on recent statistics and computer modeling, currently the ground watershed, residential areas and non-irrigated agriculture are the greatest contributors of phosphorus to Goose Lake.

Some aspects of phosphorus loading can't be modified by human behavior—they are simply part of the natural landscape. However, phosphorus loading from agricultural, residential and septic use of the land can be decreased or increased by human activities.

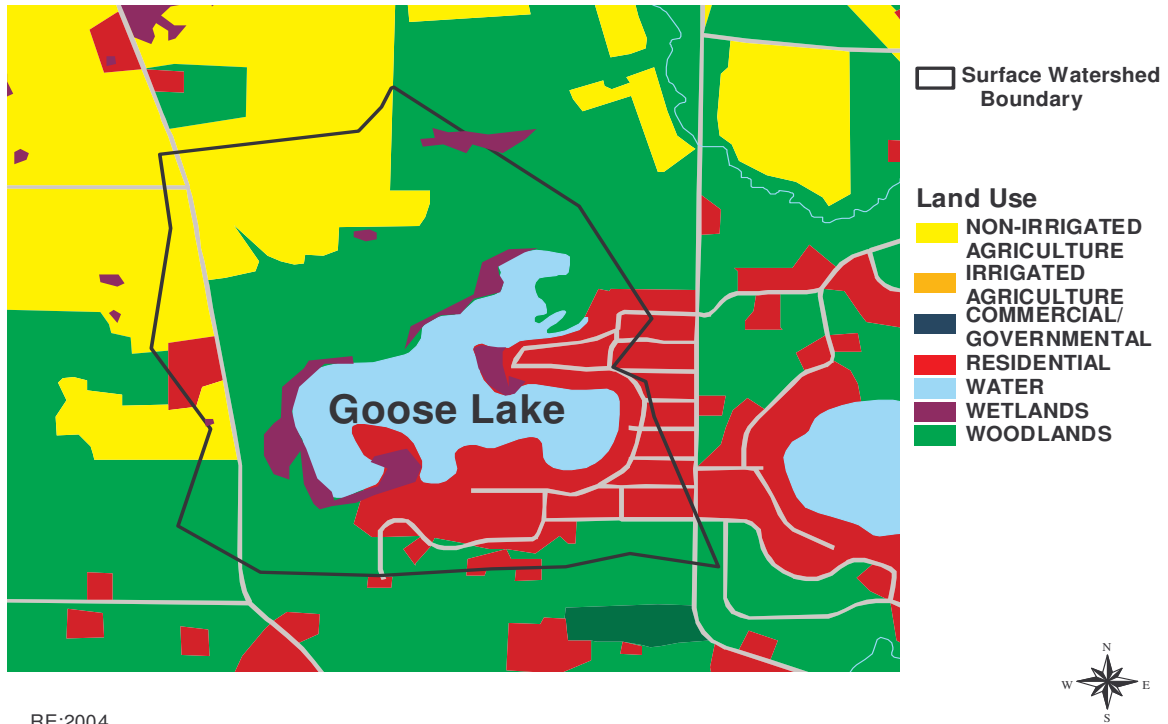
MOST LIKELY PHOSPHORUS LOADING		
BY LAND USE		lbs
	%	current
Agriculture--Non Irrigated	22.2%	28.60
Residential	18.7%	24.20
Lake Surface	8.9%	11.00
Woodland	6.3%	8.80
Septic	8.6%	10.89
Groundshed	35.3%	44.00
total in pounds/year	100.0%	127.49

A look on the chart on the next page shows that just a 10% decrease in phosphorus loading from agricultural, residential & septic use would result in 10.77 **fewer** pounds per year of phosphorus. This figure, which at first might seem small,

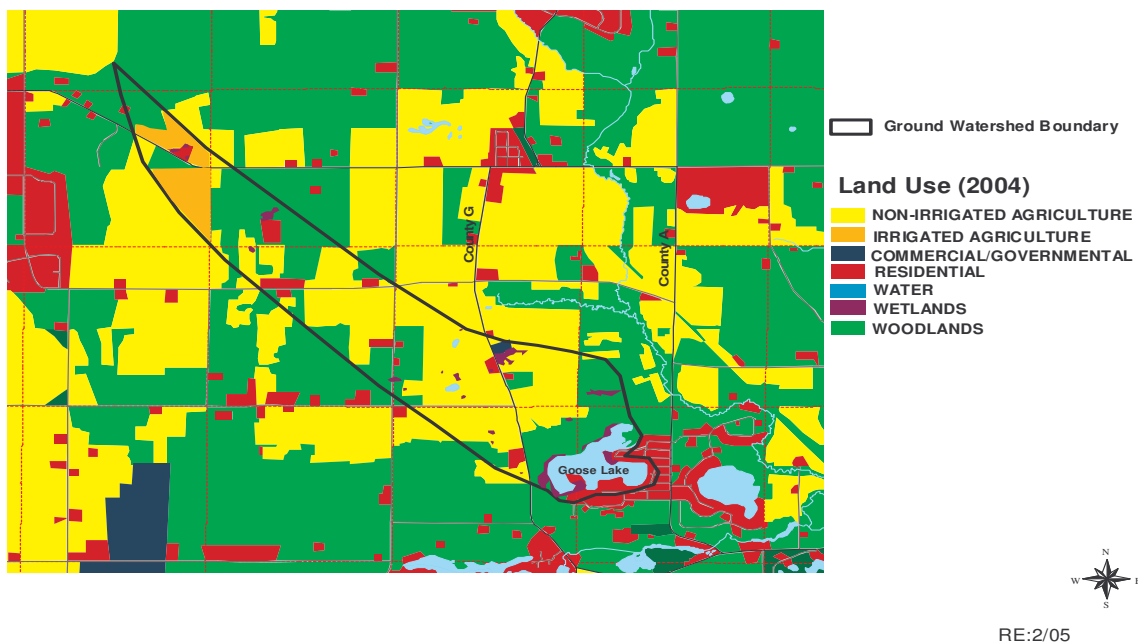
becomes bigger when it is remembered that one pound of phosphorus can produce up to 500 pounds of algae per year. 10.77 pounds per year then becomes 5385 **fewer** pounds of algae per year!

LAND USE	lbs			
	current	-10%	-25%	-50%
Agriculture--Non Irrigated	28.60	25.74	21.45	14.30
Residential	24.20	21.78	18.15	12.10
Lake Surface	11.00	11.00	11.00	11.00
Woodland	8.80	8.80	8.80	8.80
Septic	10.89	9.80	8.17	5.45
Groundshed	44.00	39.60	33.00	22.00
total in pounds/year	127.49	116.72	100.57	73.65

Goose Lake--Surface Watershed



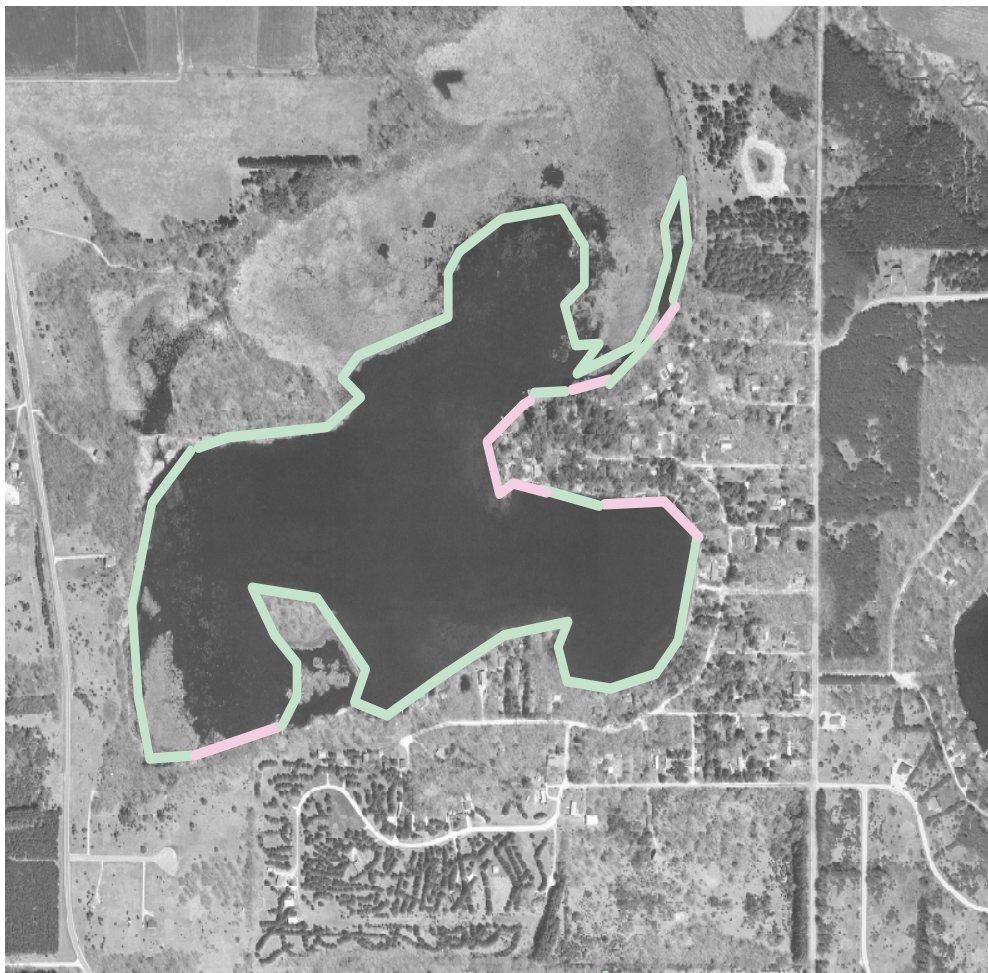
Goose Lake--Ground Watershed Land Use




Shoreland

Goose Lake has a total shoreline of 2.8 miles (14,784 feet). Much of the northern shore has been left unaltered. Included in that area are several wetland types. The rest of the lakeshore is in residential use. Most of the areas near the shore are steeply sloped, while other areas are flatter. Buildings are generally located 70 or more feet back from the shore. A boat ramp owned by the Town of Jackson is located on the east shore of the lake. There is a small beach along each side of the boat ramp area.

Shoreline--Goose Lake



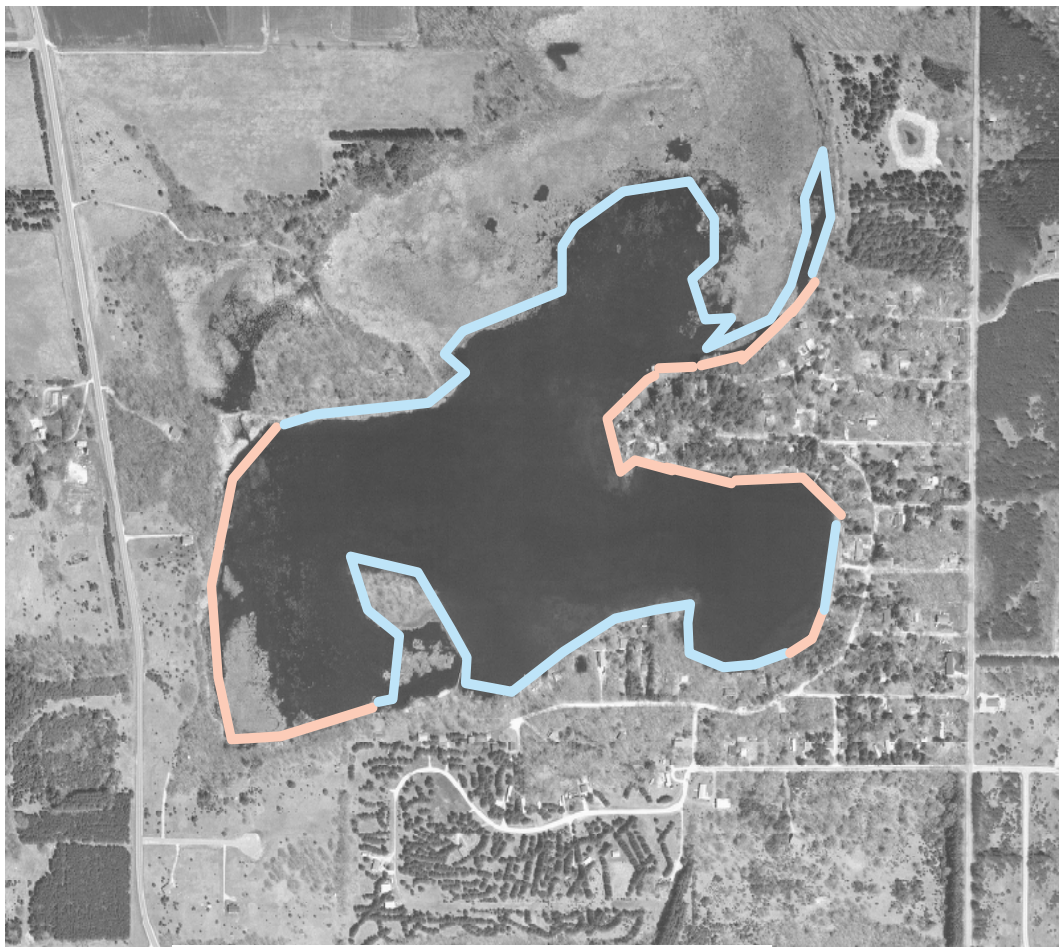
RE:4/2005

 Hard Structure/Rock/Seawall  Vegetated Shore



More than three-fourths of Goose Lake's shoreline is vegetated. A 2004 shore survey showed that most of the shore had an "adequate buffer." An "adequate buffer" is a native vegetation strip at least 35 feet landward from the shore. Most of the "inadequate" buffer areas were those with mowed lawns and insufficient native vegetation at the shoreline to cover 35 feet landward from the water line. There were also some shores characterized by hard structures (piers, patios, etc.), rock and/or seawall. The bulk of those without a sufficient buffer were found on the northeast part of the lake, just north & west of the boat ramp. Little of the shoreline had active erosion.

Buffers on Goose Lake



RE:4/2005

Pink = Inadequate Buffer Blue = Adequate Buffer

Shoreland buffers are an important part of lake protection and restoration. These buffers are simply a wide border of native plants, grasses, shrubs and trees that filter and trap soil & similar sediments, fertilizer, grass clippings, stormwater runoff and other potential pollutants, keeping them out of the lake. A 1990 study by the Wisconsin Department of Natural Resources of Wisconsin shorelines revealed that a buffer of native vegetation traps 5 to 18 times more volume of potential pollutants than does a developed, traditional lawn or hard-armored shore. The filtering process and bank stabilization that buffers provide help improve a lake's water quality, including water clarity.



Example of Adequate Buffer



Example of Inadequate Buffer

Vegetated shoreland buffers help stabilize shoreline banks, thus reducing bank erosion. The plant roots give structure to the bank and also increase water infiltration and decrease runoff. A vegetated shore is especially important when shores are steep and sandy, as are several of the Goose Lake shores.

Water Quality Information

One of the measures Wisconsin uses to give a general estimate of a lake's water quality is the **trophic state index**. This index looks at a lake's water clarity, its amount of total phosphorus (the element most related to aquatic plant and algal growth), and its chlorophyll-a level (chlorophyll-a is a pigment used by algae for photosynthesis).

Depending on the trophic index score, lakes are then classified as **Oligotrophic** (good), **Mesotrophic** (fair), or **Eutrophic** (poor):

- **Good:** Oligotrophic lakes have clear, deep water with few algal blooms. Larger game fish are often found in such lakes.
- **Fair:** Mesotrophic lakes have more aquatic plant and algae production, with occasional algal blooms and a good fishery. The water is usually not as clear as that of oligotrophic lakes.
- **Poor:** Eutrophic lakes are very productive, with lots of aquatic plants and algae. Algal blooms are often frequent in these lakes. They may have a diverse fishery, but rough fish (such as carp) are also common. Water is often cloudy or murky. Small shallow lakes are more likely to be eutrophic.

Score	<u>TSI Level Description</u>
30-40	Oligotrophic: clear, deep water; possible oxygen depletion in lower depths; few aquatic plants or algal blooms; low in nutrients; large game fish usual fishery
40-50	Mesotrophic: moderately clear water; mixed fishery, esp. panfish; moderate aquatic plant growth and occasional algal blooms; may have low oxygen levels near bottom in summer
50-60	Mildly Eutrophic: decreased water clarity; anoxic near bottom; may have heavy algal bloom and plant growth; high in nutrients; shallow eutrophic lakes may have winterkill of fish; rough fish common
60-70	Eutrophic: dominated by blue-green algae; algae scums common; prolific aquatic plant growth; high nutrient levels; rough fish common; susceptible to oxygen depletion and winter fishkill
70-80	Hypereutrophic: heavy algal blooms through most of summer; dense aquatic plant growth; poor water clarity; high nutrient levels

Goose Lake's overall TSI is 47



Water clarity readings are usually taken by using a Secchi disk (shown at right). Average summer Secchi disk clarity in Goose Lake in 2004-2006 was 7.1 feet. Water clarity in Goose Lake has consistently remained in the “good” or “very good” clarity category since 1992. Water clarity can be reduced by turbidity (suspended materials such as algae and silt) and dissolved organic chemicals that color or cloud the water.

Increased phosphorus levels in a lake will feed algal blooms and also may cause excess plant growth. The 2004-2006 summer average phosphorus concentration in Goose Lake was 16.85 micrograms/liter. This is below the 25 micrograms/liter average for natural lakes in Wisconsin and places Goose Lake in the “good” category for phosphorus levels. However, some phosphorus readings have increased since 1992, so this needs to be monitored.



The third measure used in trophic state classification is the amount of chlorophyll-a contained in the lake. The amount of chlorophyll-a found in a lake is an indication about the amount of algae in the lake. The 2004-2006 summer average chlorophyll-a concentration in Goose Lake was 5.63 micrograms/liter. This level of chlorophyll-a gives Goose Lake a “very good” ranking for chlorophyll-a (i.e., it’s very low). Since 1992, Goose Lake’s chlorophyll-a levels have remained very low.

In-Lake Habitat

Aquatic Plants

A diverse aquatic plant community plays a vital role in improving water quality, providing valuable habitat resources for fish and wildlife, resisting invasions of non-native species and checking excessive growth of the most tolerant species.

An updated aquatic plant survey was performed in 2006. The 0-1.5ft depth zone supported the most abundant aquatic plant growth, although the 1.5-5' depth zone also have abundant growth. The Goose Lake aquatic plant community is characterized by high quality and excellent species diversity. *Brassenia schreberi* (watershield), *Myriophyllum spicatum* (Eurasian watermilfoil, an invasive) and *Nymphaea odorata* (white water lily) were the most common aquatic species. Several high quality plants were found in the large wetland area on the northwest side of the lake: *Cladium mariscoides*, *Eleocharis robbinsii* (a species of special concern), *Sarracenia purpurea*, and *Utricularia minor*.

Important to maintaining a high quality, diverse aquatic plant community is an integrated aquatic plant management plan that controls the invasive plants in the lake. The most prevalent invasive exotic in Goose Lake is currently *Myriophyllum spicatum* (Eurasian watermilfoil). Other invasive plants found were *Lythrum salicaria* (Purple Loosestrife) and *Phalaris arundinacea* (Reed Canarygrass). These are present, but not common at Goose Lake.



Curly-Leaf Pondweed



Purple Loosestrife



Eurasian Watermilfoil

More detailed information can be found in the aquatic plant report of the 2006 survey, available on request from the WDNR or Adams County Land & Water Conservation Department.

Emergent Aquatic Vegetation



RE:10/06

Emergent Vegetation Found



Floating-Leaf Vegetation



RE:10/06

Floating-Leaf Vegetation Found

Submergent Vegetation in Goose Lake

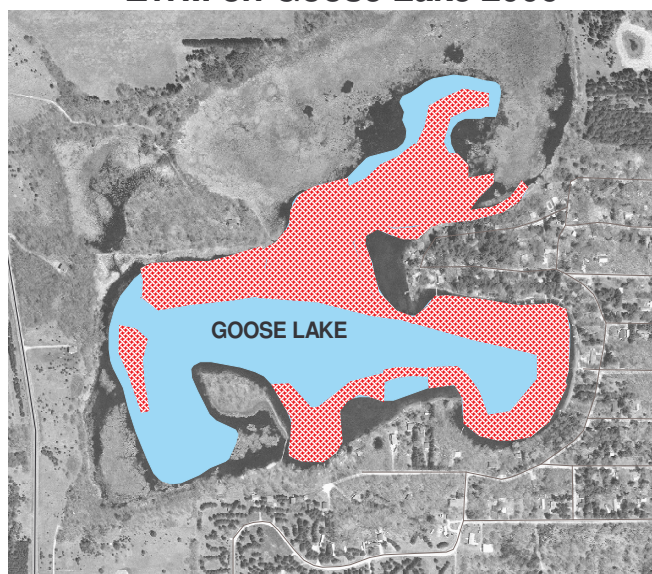


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 Submergent Vegetation Found



EWM on Goose Lake 2006



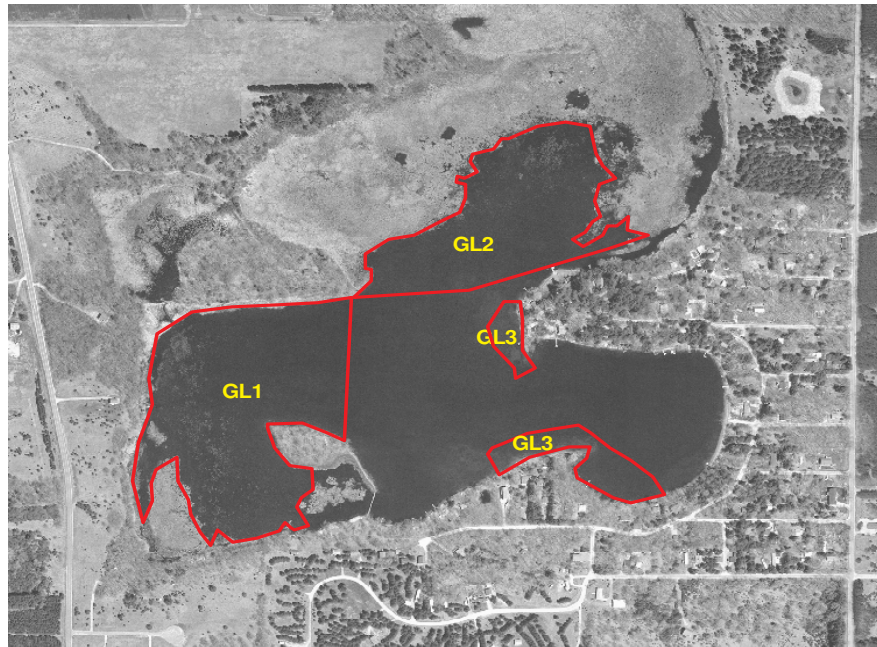
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 EWM Found



Critical Habitat

Critical Habitat Areas--Goose Lake



RE:9/06

Wisconsin Rule 107.05(3)(i)(I) defines a “critical habitat areas” as: “areas of aquatic vegetation identified by the department as offering critical or unique fish & wildlife habitat or offering water quality or erosion control benefits to the body of water. Thus, these sites are essential to support the wildlife and fish communities. They also provide mechanisms for protecting water quality within the lake, often containing high-quality plant beds. Finally, critical habitat areas often can provide the peace, serenity and beauty that draw many people to lakes in the first place.

Three areas on Goose Lake were determined to be appropriate for critical habitat designation. GL1 extends comprises the west basin, up to the ordinary high water mark. GL2 extends covers the north basin, mostly a wetland area. GL3 was added in 2006 and cover areas of the west and south shore

The Critical Habitat Report for Goose Lake has more specific information on these sites. Copies are available from the Adams County Land & Water Conservation Department.

Part of GL1



Part of GL2



**Part of
GL3**

Fishery/Wildlife/Endangered Resources

WDNR fish stocking records for Goose Lake go back to 1937, when several thousand bullheads were put into the lake. Stocking continued into the 1970s and included more bullheads, as well as bluegill, crappie, largemouth bass, northern pike, perch and sunfish. There was a long history of fish winterkills, until the current aerators were installed. The most recent fish inventory, in 2004, found that bluegills were abundant, largemouth bass were common, but northern pike and black crappie were scarce.

Muskrat and mink are also known to use Goose Lake shores for cover, reproduction and feeding. Seen during the field survey were various types of waterfowl, songbirds, and turkey. Frogs and salamanders are known, using the lake shores for shelter/cover, nesting and feeding. Turtles and snakes also use this area for cover or shelter in this area, as well as nested and fed in this area. Upland wildlife feed and nest here as well. One other endangered plant species was previously found in Goose Lake: Capitate Spikerush. This was not found during the 2006 aquatic plant survey.

Recommendations

Lake Management Plan

- If the lake management plan submitted in early 2007 is approved by the WDNR, continued review of the plan needs to occur regularly, making sure the plan covers at least the following aspects concerning the management of the lake: aquatic species management; control/management of invasive species; wildlife and fishery management; nutrient budgeting; shoreland protection; critical habitat protection; water quality protection.

Watershed Recommendations

- Since computer modeling results suggest that input of nutrients, especially phosphorus, are a factor that needs to be explored for Goose Lake, it is recommended that both the surface and ground watersheds be inventoried, documenting any of the following: runoff from any livestock operations that may be entering the surface water; soil erosion sites; agricultural producers not complying with nutrient management plans and/or irrigation water management plans.
- If such sites are documented, Goose Lake Association should encourage Adams County LWCD and landowners to design & implement plans to address the sites.

Water Quality Recommendations

- All lake residents should practice best management on their lake properties, including keeping septic systems maintained in proper condition and pumped every three years, eliminating the use of lawn fertilizers, cleaning up pet wastes and not composting near the water.
- Reducing the amount of impervious surface around the lake and management of stormwater runoff will also help maintain water quality.
- Residents should become involved in the Citizen Lake Water Monitoring Program. This includes training for water quality monitoring, invasive species monitoring, and Clean Boats, Clean Waters.
- Lake residents should protect and restore natural shoreline around Goose Lake, especially along the northeast shore. There is evidence that shore disturbance is negatively impacts the aquatic plant community of a lake.

Aquatic Plant Recommendations

- All lake users should protect the aquatic plant community in Goose Lake by assisting in developing and implementing an integrated aquatic plant management plan that uses multiple methods of control.
- The Goose Lake Association should maintain exotic species signs at the boat landings and contact WDNR if the signs are missing or damaged.
- The Goose Lake Association should continue monitoring and control of Eurasian Watermilfoil maintain the most effective methods and modify if necessary. The Lake Association should investigate ways to increase treatment effectiveness in the deeper water. Residents may need to hand-pull scattered plants.
- A milfoil weevil survey should be conducted on Goose Lake in order to evaluate milfoil weevil availability for assistance in controlling the Eurasian Watermilfoil.
- Shores with inadequate buffers need to restore the buffers to an adequate condition to provide winter habitat for the weevils, as well to assist in maintaining water quality.
- Lake residents should get involved in the county-sponsored Citizen Aquatic Invasive Species Monitoring Program. This will allow not only noting changes in the Eurasian Watermilfoil pattern, but also those for Reed Canarygrass, Curly-Leaf Pondweed and Purple Loosestrife. Noting the presence and density of these plants early is the best way to take preventive action to keep them from becoming a bigger problem.

Critical Habitat Recommendations

- Maintain current habitat for fish and wildlife.
- Investigate availability of areas for northern pike spawning. Increase such sites if necessary to encourage more reproduction of northern pike.
- Leave fallen trees along shoreline & in water. Leave snags & cavity trees for nesting.
- Seasonal protection of spawning habitat.
- Maintain the wildlife corridor.
- Maintain sedge meadow/deep marshes areas.
- Protection emergent vegetation. No alteration of littoral zone except for WDNR-approved projects.
- Seasonal control of exotics. Regular monitoring for presence of exotics.
- No bank grading or grading of adjacent land.
- Maintain aquatic vegetation in undisturbed condition for wildlife habitat, fish use and water quality protection.
- Maintain no-wake zone designations, especially in critical habitat areas.